from the Inquisition, but passes over in silence Galileo's perfectly explicit declaration that the order in question had come to him through no other person than Cardinal Bellarmine. Any one who knows how different are the parts assigned in the Vatican manuscript to the Cardinal and to the Commissary will see at a glance the serious nature of this last omission.

On p. 231 an argument is advanced, the futility of which one would have thought must have been obvious to the possessor of the most elementary knowledge about inquisitional suits in general, and that of Galileo in particular. M. de l'Epinois expresses astonishment that Galileo, if he was really conscious of having been condemned on a trumped-up charge, should not have left behind him, in letters to his friends, some protest against the abominable act of fraud of which he had been the victim.

Now, in the first place, it was the regular practice of the Inquisition to exact from those who appeared at its bar an oath of absolute silence, under pain of excommunication in case of contravention, as to everything which had occurred within the sacred tribunal. We know from the Vatican MS. that this precaution was taken in the case of Galileo. Further, the sentence of 1633 menaced him with being treated as a relapsed heretic (*i.e.* burned alive) if he should venture to treat of his condemned opinion of the earth's motion in any manner whatever. Lest it should be supposed that this was a piece of mere formality, the Inquisitor of Florence, during Galileo's subsequent practical imprisonment in his own villa at Arcetri, threatened him in the most unmistakable language with immediate incarceration in the actual dungeons of the Roman Inquisition if he should dare to propagate in conversation the Copernican doctrine.

It requires, then, little prophetic gift to foresee what would have befallen Galileo had he been detected setting in circulation a charge of the blackest fraud against the supreme tribunal of the Inquisition. His silence on the subject can cause those who believe in the reality of this fraud no astonishment whatever. The only surprise they are likely to experience is that a writer so exceptionally acquainted with the details of Galileo's case as is M. de l'Epinois, should have esteemed an argument of this kind worthy of a place in his pages.

I cannot think that M. de l'Epinois is more successful in setting up a positive theory of his own than he is in demolishing that of Wohlwill. He maintains a thesis favourable to the Roman authorities, but it is based on efforts to explain away, or assert away, palpable contradictions, and on gratuitous and mutually destructive assumptions. In short, his whole treatment of the issue essentially in dispute is both superficial and unsatisfactory.

Father Desjardins, of the Society of Jesus, tells the world that, inspired with sacred boldness (*de saintes audaces*), he has torn from the hands of the Church's enemies a weapon of which they had made sinister use, by restoring to the incident of Galileo so long travestied by ignorance and bad faith, its veritable physiognomy. His preface concludes with the following piece of advice to such of his readers as may be disposed to criticise the acts and institutions of the Roman Church in this or any other case:—

"Approve everything without hesitation, and soon philosophic examination will reward your confidence by presenting to you a complete demonstration of all these things!"

Such a maxim is so little likely to find favour with readers of NATURE that I shall trouble them no further with the magniloquent Jesuit's production which is as superficial, arrogant, and inconclusive as its pompous exordium would lead one to expect.

In terminating this notice it may be as well to remark that the question whether Galileo was or was not fraudulently convicted and condemned remains still undecided. The Roman authorities have not as yet taken the one step which offers some chance of settling, and could hardly fail essentially to narrow, the issue. This consists in allowing free access to, and facsimile reproduction from, all and every portion of the Vatican MS., instead of restricting, as appears hitherto to have been done, this privilege to members of the Roman Church supported by ambassadorial or episcopal recommendations.[1]

SEDLEY TAYLOR

THE MANUFACTURE OF SULPHURIC ACID AND ALKALI

A Theoretical and Practical Treatise on the Manufacture of Sulphuric Acid and Alkali with the Collateral Branch. By George Lunge, Ph.D., F.C.S., Professor of Technical Chemistry at the Federal Polytechnic School, Zurich (formerly Manager of the Tyne Alkali Works, South Shields). Vol. i. (John van Voorst, 1879.)

WE heartily welcome Prof. Lunge's volume on the manufacture of sulphuric acid. It is the result of a rare combination of thorough knowledge of scientific theory with that intimate experience of the practical manufacture which can only be gained by those who come into daily contact with the problems presenting themselves in dealing with chemical operations on a large scale.

In his preface our author distinctly states the object he has in view, and very modestly but clearly indicates the claims upon which he founds his right to speak: "The present treatise," he says, "is intended to supply various wants, and accordingly appeals to various classes of readers. In the first place, it gives a scientific description of all the substances occurring in the manufacture of sulphuric acid, alkali, and bleaching powder, either as raw materials or finished products, according to the most recent statements. Secondly, it is intended as an aid in the study of technical chemistry by giving a complete description, both technical and theoretical, of all the processes occurring in this series of manufactures. Its third and principal object is to give to practical manufacturers both complete and reliable information upon all the apparatus and processes which have come under the author's notice. . . . Much space is taken up by the discussion of the innumerable publications in English, German, and French, referring to this industry, but even more space was required for the faithful rendering of the author's personal observations and experiences. His own practice of eleven years in the north of England has been

[1] Wolynski. Nuovi documenti inediti del Processo di Galileo Galilei Firenze, 1878, p. 13.

supplemented by numerous visits to other alkali-manufacturing districts of Britain and the Continent. The author's present position as professor at a technical high school enables him to state frankly what he knows and what he has seen, since he can expect no benefit from keeping anything back."

Every one who reads the volume before us will feel that Prof. Lunge has admirably succeeded in the serious task which he has set himself to accomplish, and there is no doubt that he has thus not only filled up an important lacuna in our chemical literature—for in no sense can any other existing work on the subject be said to be satisfactory—but he has given us a work which must become a standard one.

The importance and magnitude of the British sulphuric acid trade will best be understood when we remember that cheap glass and cheap soap—or light and cleanliness—depend upon the cheap production of oil of vitriol; and when we learn that Great Britain manufactures about five-eighths of the production of the world, and that the annual amount made in this kingdom now reaches the enormous figure of 832,000 tons.

Nor is it in quantity alone—although that is, after all, the true measure of a successful trade—that the English manufacturers stand pre-eminent. In all the great improvements which have taken place, England has fully held her own with her perhaps more highly-educated Continental rivals. Thus, although the introduction of pyrites in place of brimstone is often accorded to Messrs. Perret of Chessy, in 1835, there is no doubt that Mr. Hill of Deptford patented the process in 1818, whilst the first to employ pyrites on a large scale was Thomas Farmer of London. Passing again to the mechanical devices for burning pyrites, we find that Dr. Lunge gives an unfavourable opinion as to the construction and mode of working of the Continental burners, and acknowledges that the English form is that which yields the best results, and is now being largely introduced in both France and Germany.

Then, again, as regards the construction of the now all-important leaden chamber, we find that an Englishman, Dr. Roebuck of Birmingham, was the first to erect such a chamber in 1746. And if it is to the genius of Gay-Lussac in 1827 that we owe the idea of the recovery of the excess of escaping nitrous fumes, by passing the exit gases through a shower of strong sulphuric acid, we must remember that this part of the manufacture was not perfect until Mr. Glover proposed the addition of his denitrating tower. All these, and many other inventions and appliances made by intelligent English manufacturers, are clearly stated by Dr. Lunge, who appears to be perfectly free from bias, and discusses the whole subject with a thoroughly scientific spirit. Our English system of Government inspection of sulphuric acid works also comes in for a proper share of notice and commendation, although we do not find mention made of the labours of the recent Noxious Vapours Commission, founded upon whose report the Government have brought forward a new Noxious Vapours Act, which is to include a large number of works, especially vitriol works, which as yet are not placed under inspection. Several of the various proposals which have been made by the chief inspector, Dr. Angus Smith, and his staff, are dwelt upon. Especially we would notice Fletcher's valuable anemometer for the measurement of the draught in flues and chimneys, upon the results of which the escapes of acid are ascertained.

Dr. Lunge has lived so long amongst us that he not only fully appreciates highly our manufacturing skill, but he is able to express his appreciation in terse and luminous English. The illustrations, too, with which the volume teems are of the highest excellence, drawn, as they all appear to be, to scale, and engraved with the care and precision which is characteristic of the great publishing house of Vieweg and Sons of Brunswick. From whatever point of view we consider his labours, there is no doubt that they will be highly valued both by students and manufacturers, and we can confidently recommend this first volume of Dr. Lunge's work to all those who, from the scientific or from the practical side, are interested in this most important chemical manufacture.

H. E. ROSCOE

OUR BOOK SHELF

On the Origin of the Laws of Nature. By Sir Edmund Beckett, Bart. (London: Society for Promoting Christian Knowledge, 1879.)

THIS is a very clever little book, and deserves to be widely read. Its subject, however, is scarcely one for our columns. For it is essentially "apologetic," and its strong point is not so much accurate science as keen and searching logic. It dissects with merciless rigour some of the more sweeping assertions of the modern materialistic schools, reducing them (when that is possible) to plain English so as to make patent their shallow assumptions. When, from the inherent vagueness of a statement, the author finds himself unable to present it in intelligible and simple language, he gives by apt analogy a clear view of its absurdity. He follows out in fact, in his own way, the hint given by a great mathematician (Kirkman) who made the following exquisite translation of a well-known definition :—

"Evolution is a change from an indefinite, incoherent, homogeneity to a definite, coherent, heterogeneity, through continuous differentiations and integrations."

[*Translation into plain English.*] "Evolution is a change from a nohowish, untalkaboutable, all-alikeness, to a somehowish and in-general-talkaboutable not-all-alikeness, by continuous somethingelsifications and sticktogetherations."

The following quotations, taken almost at random, give a fair idea of the style of the book :—

"You may say perhaps that this is just Hume's famous argument against miracles, viz. that all experience is against them, while lying is not at all contrary to experience. But that again is a mere paradox, or a verbal trick which either begs the question or is absurd. For if by 'all experience' he meant literally all experience, that simply begs the question; and if he meant only general experience, it sinks into the platitude that miracles are uncommon. Again, if the prevalence of lying were a sufficient reason for disbelieving any extraordinary story, then we must not believe that any extraordinary event ever happened: which is absurd."

"In that respect there is no difference between a single atom and that congeries of atoms which for the time makes up a man: at any rate atheistical philosophers admit none: according to them it is matter (*i.e.* the atoms of it) 'that has the promise and potency of life,' and man is only a machine resulting from their spontaneous action under laws and forces which always existed without any cause. But if the most determined man in